

SCIENCE.

FRIDAY, AUGUST 6, 1886.

COMMENT AND CRITICISM.

A RECENT NUMBER of the Philadelphia *American* has an article on 'Unrecognized proprietorships,' pointing out the difficulties encountered in 'rewarding men of the most beneficent inventiveness,' and recounting with many illustrations how seldom the originator of a new device reaps a fortune, while those who come after and make new adaptations of the original artifice become prosperous. Wyatt invented roller-spinning, and Hargreaves invented the spinning-jenny; but Arkwright appropriated both, and was the only 'successful' man of the three. On reading further, it is with surprise that we find 'Myer,' whose 'weather-charts have saved thousands of dollars,' classed, not with the successful Arkwrights, but with the neglected Wyatts and Hargreaves, where he is notoriously out of place. It is difficult to say in whose mind the idea of daily weather-charts first took practical shape; but the idea was fully carried out in Europe several years before its introduction here, if we except the charts with which Professor Henry used to entertain visitors to the Smithsonian in 1859 or 1860, and which might have early grown into a systematic service had it not been for the interruptions of 1861. Besides this, Professor Cleveland Abbe had, with the assistance of local enterprise, established an actual, continuous, and successful weather-service in Cincinnati a year before weather-prediction was undertaken by the government. It was essentially this Cincinnati service that General Myer, with his imperious executive ability and the support of the government treasury, appropriated and expanded into a national service; taking not only its methods, but its director, who has ever since been, even though anonymously, the leading scientific member of the weather-bureau. The *American's* article is an example of the very neglect that it laments.

A SON OF CHARLES GOODYEAR, the well-known inventor, has lately felt it to be his duty to make public some particulars in respect to the origin of the india-rubber patents, which, if not hitherto

unknown, have been generally forgotten by those who participate in the great advantages which have followed the wonderful expansion of india-rubber manufactures. He wishes particularly to controvert the idea that his father's discovery was accidental; and for this purpose he publishes his father's account of the various steps which were taken by him as far back as 1838 to ascertain what modifications could be made in 'the material,' as he was accustomed to call the gum-elastic, in order to adapt its peculiar properties to the greater service of mankind. The inventor's own narrative was printed in 1849, in a very few impressions, upon thin sheets of a tissue made of cotton, and shows conclusively by what prolonged, intelligent, painstaking endeavors he reached the processes which are known as 'vulcanization.' Few persons are aware of the great changes which were introduced by these discoveries, or of the constant increase in india-rubber manufactures. In 1870 the imports of the crude material were five million pounds; in 1885 they were twenty-five millions.

The narrative from which we draw these particulars also calls attention to the fact that Goodyear at an early day foresaw most of the innumerable applications which were destined to follow the promulgation of his process. There is a circular of his, which was issued in 1844, announcing the invention or discovery of 'a metallic gum-elastic composition,' enumerating its properties and its possible uses, and inviting 'the most searching investigation and the most severe trial.' In the light of all that has followed, the prophetic sagacity of the inventor is as noteworthy as his inventive power. It is a pity that a life arduously devoted to the advancement of an idea which was fertile in utilities should have been so much depressed at one stage by penury, at another by extreme ill health, and again by vexatious and almost interminable litigations. The final decision of the U. S. supreme court, confirming Goodyear's claims, was given four years after the patent had expired, and eight years after his death.

DR. M. A. VEEDER of Lyons, N.Y., has sent a letter to the *Rochester Democrat and Chronicle*

(July 21) on 'The significance of coincident weather-conditions,' in which he points out that the recent tornadoes in Kansas City and Madrid were nearly simultaneous, that the late 'sirocco' in Dakota accompanied intense heat in southern Europe, and that many other examples of corresponding weather may be found in widely separated localities. From this basis he concludes, without any sufficient examination of the dissimilar weather that so generally prevails in widely separated localities, that "the common cause which originates wide-spread atmospheric conditions of exceptional character . . . can be none other than variations in the condition of the sun." This can hardly mean that the appearance of a spot on the sun at once brings forth tornadoes on the earth: tornadoes are known to arise under much more local conditions; and the coincidence of their occurrence in Kansas and Spain is most trivial when it is recollected that the large disturbances in which the tornadoes spring up probably came from remote beginnings, unequally distant in time and place from these points of action. The coincidence is especially trivial in view of the great amount of non-coincidence it has to balance. Yet if this be not the meaning, the suggestion is simply a vague truism, of no value from its very antiquity and indefiniteness. No one will deny that the sun is at the bottom of all our weather-changes; but who will explain the full control that it exerts, and follow the process from beginning to end?

Theories of this kind have a remarkable resemblance. They pass at once from near effect to a remote cause, impatiently bridging over with wide-spanning assertions a whole world of process that lies between. They fail to see behind the immediate facts, and discover the long train of events leading up to them. They represent the theory of special creations on the inorganic side of nature. They always include a convenient corollary of about this form: "the disturbing influence due to changes in the condition of the sun may be modified to some extent by local conditions, so that it will not always manifest itself in the same way in every part of the earth." What, with an entire lack of definition of the sun's disturbing influence, a complete assortment of 'local conditions' on the earth, and a glorious variety in our weather, coincidences may be found without limit. Finally, there is the unfail-

ing presumption of novelty. "Studied in this way, meteorology becomes a science. The mere collection of miscellaneous facts without reference to underlying causes gives no insight, and reaches no conclusion;" but the new theory "may serve at least to direct our inquiries, and may open up new and unexpected fields of research"—just as if the ideas of his letter had not been written over and over again, until their truth and error are almost as old as the beautiful hills around Dr. Veeder's home!

THE POISONING of 143 persons in Michigan, followed by a similar accident in Charleston, Ill., by which fifty persons were made sick, both attacks being attributed to ice-cream, has incited chemists throughout the country to examine critically the ingredients employed, in order to discover if possible which one is accountable for the poisonous effects. As has already been stated in *Science*, Professor Vaughan of Michigan charges it upon tyrotoxinon, a new poison which he has discovered, and which he believes to be produced during the decomposition of milk. Professor Bartley of the L. I. college hospital has investigated a number of cases, and gives as his opinion that the deleterious effects produced in these cases of poisoning by ice-cream is due to the gelatine which is now largely employed by manufacturers of ice-cream to give body to their product. If this gelatine is of poor quality it readily undergoes decomposition. Dr. P. A. Morrow, in the *Medical record*, July 24, 1886, refers the poisonous effects to the flavoring extract, and finds that in all the reported cases vanilla has been used for this purpose. He has found a number of references to similar poisoning-cases in French and German literature, which toxic phenomena have been spoken of as 'vanillism.' In Europe for years the vanilla used in flavoring ices and pastries has been recognized as in some cases poisonous. Orfila more than thirty years ago recorded such cases. Whether these poisonous effects are due to some principle in the vanilla bean itself, or to cardol, which is an oil used as a coating to prevent the deterioration of the bean, or to the too early gathering of the pods, is still a matter of dispute. It is to be hoped that the cause of the frequently occurring poisonings may be soon determined on, that ice-cream may not cease to be a part of the bountiful feasts provided at church picnics.

THE AMERICAN NEUROLOGICAL ASSOCIATION.

THE twelfth annual meeting of the neurologists of America took place at the Howland house, Long Branch, N. J., on July 21, 22, and 23. The membership of this body is limited in number, and is intended to include eminent specialists on nervous diseases and workers in allied branches of science. From fifteen to twenty members attended the sessions, which is about the usual annual attendance.

Dr. Burt G. Wilder, professor of comparative anatomy at Cornell university, called the meeting to order and delivered the address of the retiring president. The address was devoted to the description of an embryonic fissure not hitherto noticed.

Dr. Wilder then introduced Dr. Charles K. Mills, the president-elect, of the medical department of the University of Pennsylvania. The address of the president was a plea for the extension of the activity of the association so as to enroll all the active neurologists of the country, and the distinct adoption of a broad psychological point of view, so that papers on scientific topics closely related to the interests of the practising neurologists might be then presented. The president also favored the proposition that the association should meet biennially as a section of the proposed congress of American physicians and surgeons.

The scientific portion of the address consisted in the presentation of a number of human brains abnormal in some way or other. The brains of a delusional monomaniac who perished at the fire at the insane department of the Philadelphia almshouse; of Taylor who was executed for the killing of his jailor, and who had committed other murders; of an adult idiot, one of three brothers similarly affected; of a negro; and what is very rare, of a Chinaman — were exhibited, and notes upon the brains of three other murderers, one of whom was afterwards afflicted with paralytic insanity, were read. In the paper to be published by Dr. Mills, he will treat in detail the peculiarities of the individual brains; in his address he confined himself more to a general presentation of their characteristics. The brains were all of a low type and showed similar affinities. The brain of the Chinaman was characterized by a shortening and obliquity of the orbital surface corresponding to the peculiar set of the eyes in that race, and by the extension of the first temporal convolution well up into the parietal lobe.

The presentation aroused great interest and much discussion. There was a general agreement that the brains had strong sutural, foetal, and low race-type characteristics.

Dr. L. C. Gray of Brooklyn gave an account of a case of lesion of both temporal lobes without word-deafness (sensory aphasia), but with a remarkable loss of memory. The patient seemed to have lost all retention of impressions whatever. For example, he was once hammering on the door. The doctor asked him to stop, as he was annoying others; he understood the request and complied with it after asking the reason for his stopping. The doctor had hardly left the room when the hammering began anew. He was again asked to stop; again asked the same question; had no recollection of the previous request and again promised to stop, but again forgot. His letters show the same state of mind; while otherwise rational, sudden breaks will occur in the writing, and then will follow the words, "I don't know when I wrote the above, whether yesterday, an hour, or a minute ago," or words to that effect. In short, his time-sense and retentiveness had almost completely vanished. The patient, whose age was forty-three, had an attack of convulsions, remained comatose for thirty-six hours, and then died. At the autopsy the skull and dura were found normal, and with slight exceptions, the only lesions were found in the temporal lobes in the parts supplied by the sylvian artery (septomeningitis). Dr. Gray laid special stress on the point that both lobes were affected, and thought that our views regarding the seat of the language-centre needed modification.

Dr. Leonard Weber of New York discussed some affections of the nervous system associated with tuberculosis. Attention was especially directed to the fact, illustrated by cases, that the nervous symptoms often appeared long before the usual symptoms of approaching tuberculosis could be detected. These nervous symptoms were often depressive in their nature, with a loss of interest in one's occupation, with little or no tendency to periodicity, and generally a well-developed suspicion of the doings of one's fellow-men. The cases generally showed hereditary taint, and were confined to women. An important part of the treatment consisted in restoring a healthier moral tone.

Dr. Phillip Zeuner of Cincinnati presented in person a case of auctioneer's cramp. The patient was first made aware of his trouble by a difficulty in crying his sales. He found himself unable to keep up the continual repetition of the same words, without causing a spasm on the left side of the mouth which eventually made the action impossible. He soon found that he could relieve the difficulty by lifting with a pencil one corner of his mouth. For a time the difficulty was confined to his professional duties, but gradually it extended, though less noticeably, to his ordinary

conversation. The pronunciation of sounds not involving the lips, as *a* and *s*, was not interfered with. The case was regarded as one of the professional neuroses, arising from the too constant use of very specialized and delicate muscles, of which writer's cramp is the best-known type. In addition to the usual features of such a cramp, there were present subjective symptoms of a depressive, melancholic nature. In the minds of some of the members the case was strongly suggestive of a facial hemiparesis.

Dr. Wilder exhibited a frog from which the cerebral lobes had been removed on the 9th of last December, and which was in good healthy condition. In fact, Dr. Wilder could not see why such a frog should not live on indefinitely; he was freed from all wear and tear on his nervous system, was liberally fed, and was, in short, a living automaton. The frog behaved quite like those in the experiments of Professor Golz of Strassburg: and was presented only to show how long such an animal could be kept alive. Dr. Wilder used the occasion to record a few observations which might be new, and to suggest some further inquiries. Spontaneous movements were noticed every few hours. At times the frog was observed to wink with one eye only. A curious observation was that of the simultaneous performance of opposite reflexes. When a minnow was forced down the frog's mouth, it was swallowed by the reflex irritation of the head of the oesophagus, and at the same time the other end of the minnow was still twitching in the mouth and hanging out; the frog would attempt to remove the minnow with his leg, and swallow at the same time. Dr. Wilder asked whether such frogs sleep, whether they were capable of sensory education, whether they could breed, and so on.

Dr. Wharton Sinkler of Philadelphia described the treatment of a case of facial spasm in which, after various attempts at relief, the nerve was stretched, with the result of doing away with the spasm but leaving a paralysis after the operation. Similar cases were also referred to.

Dr. Wilder exhibited the head of a murderer cut in the median plane and showing the position of the brain in the skull, as well as other points. The preparation, which was unusually successful, was exhibited in order to describe the method of preparing it. After washing out the blood-vessels with a five per cent solution of chlorohydrate, a continuous injection of alcohol at first 65 per cent strong and gradually rising to a 94 per cent solution was kept up for a week. The injection was done under a high pressure, and the alcohol cooled to a temperature of about 10° C. by passage

through an ice chest. The head was then imbedded in plaster of Paris and firmly fixed so that the saw would pass directly through the median plane.

Dr. Lloyd read a paper on moral insanity, in which he held the view that the name was a misnomer, that the physician had only to deal with disorders of the functions of the cerebral mass, and that moral insanity was only a form of intellectual insanity. The paper also criticised the psychologists who neglect physiological considerations, and cautioned physicians from falling into the mistakes of metaphysicians by creating abstract entities and treating them as real things. The paper aroused considerable discussion.

Among the papers presented were the following: Dr. Sarah J. McNutt of New York read a note on the case of an infant with multiple tumors of the cerebrum. Dr. G. Betton Massey exhibited diagrams designed to show by the graphic method the significance of Ohm's law; and also read a paper on the 'Cause of electrotonus and of the normal formula of polar reactions.' Dr. Wilder presented some notes on the brain, the first of which related to a new fissural integer which he would call the 'parocipital.' The next was devoted to the demonstration of an ental ridge corresponding with the occipital fissure; while the third referred to the appearance of a horizontal section through the foetal brain in man. Dr. C. L. Dana of New York considered some cases of pseudo-tabes from arsenical poisoning. Dr. Fisher presented some remarks on epilepsy, in which he inclined to the view that the disease was organic rather than functional. Dr. Sachs described a case of right hemiplegia with aphasia in a child of two and a half years. Dr. V. P. Gibney of New York recorded a case of pseudo-hypertrophic paralysis, in which the microscopic examination of the spinal cord revealed changes in the anterior horns consisting in a diminution and loss of processes of the cells, especially in the dorsal and lumbar regions. The importance of the observation consists in the fact that such changes have been looked for in many cases, but none could be found. The propositions were demonstrated by Dr. Amidon.

Papers by Dr. Gibney and Dr. Dercum were announced but not read. A photograph of a microcephalic girl was received from Dr. Forel of Switzerland and ordered to be reproduced and published. A letter from the late Dr. Gudden was also read.

It was decided to meet at Washington in June of next year. Dr. Gray of Brooklyn was elected president, and Dr. Hammond of New York secretary, for the coming meeting. The meeting at

Long Branch was considered a very successful one, both for the character of the papers read and the interesting discussion which they aroused.

COREA BY NATIVE ARTISTS.

THE testimony of recent explorers in Corea is to the effect that we have there a human exemplification of the survival of whole genera of industries and customs, while in surrounding regions these have been swept away or transformed. Half-a-dozen charming books on Corea, notably those of Griffis and Lowell, have lately portrayed portions of the inner life of a land hitherto closed to our gaze. No small curiosity has been manifested to ascertain how far these gentlemen have told the truth, whether they have faithfully interpreted what they narrate, and whether they are dealing with normal life or with monstrosities.

Ensign Bernadou, U. S. N., has just sent to the national museum a small but wisely chosen collection of art products to illustrate social and industrial life in Corea. Among his specimens is a series of old screens painted in oil on silk, and depicting the paying of tribute by surrounding nations to the emperor of China. An outer court is filled with attendants, beasts of burden, palanquins, and gifts in endless variety from every part of eastern Asia. Coreans, of course, hold a prominent place. A long procession of ambassadors from these various countries marches through massive gateways, along narrow courts, and over elevated bridges to the throne. There sit the reigning sovereign and his family, guarded by soldiers and attended by nobles. In front of the throne kneel the tribute-bearers with their gifts. The faces, costumes, and postures are accurately drawn, but the perspective is thoroughly Chinese in the method of taking advantage of the whole space.

This work of art introduces us to the high life of Corea; but Ensign Bernadou has also had the good fortune to obtain nearly a hundred old water-color sketches by native artists, portraying industrial life and natural scenery. Eight of these paintings are presented in the accompanying plates. They are rather studies in real life than finished paintings, the latter usually partaking of the grotesqueness characteristic of both Chinese and Japanese.

Corean women washing clothes (fig. 1). — Women are not seen abroad, says Mr. Lowell, excepting servants at the wells, and washerwomen. In Corea, garments are taken apart to be washed, both the cleansing and the subsequent mangling

being effected by means of clubs. When the garment is restored, the seams are pressed close with a very narrow smoothing-iron.

House-builders at work (fig. 2). — Mr. Lowell also describes minutely the work of the joiner and the tiler. Hod-carriers are unknown, and unnecessary, because the attendant can easily throw his tiles to the workman while the balls of mud are passed up in netting. The 'chalk line' is blackened with ink. Plane, saw, square, and adze are of the most primitive type. The presence of 'the all-seeing eye' also seems necessary.

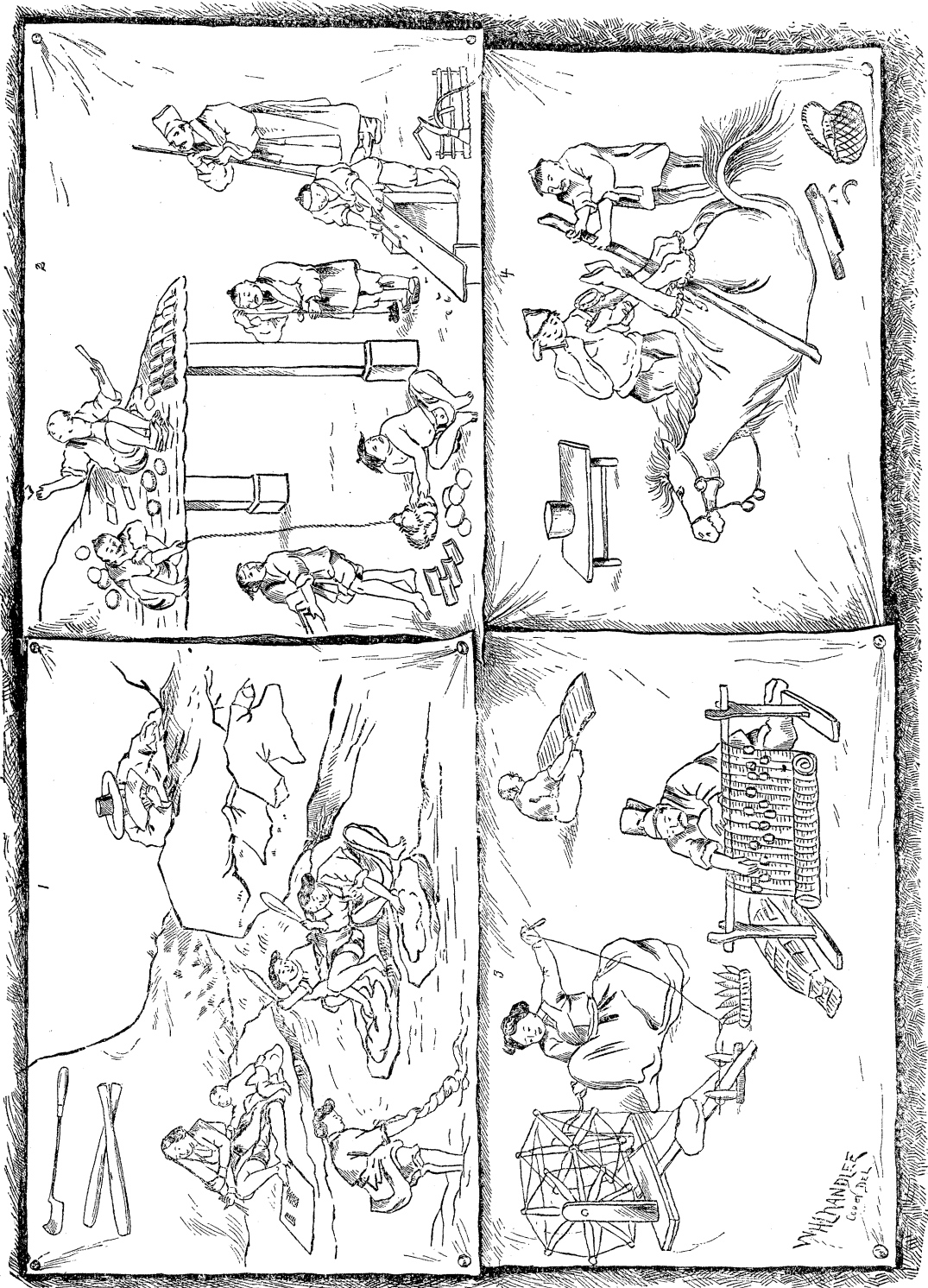
Spinning and weaving (fig. 3). — The textile practices of Corea exhibit the most primitive types of Chinese weaving. The loom for matting is very rude, although the work is excellent. The warp is held in place by a stone tied to the end of each thread. Half of these rest on one side, and half on the other side, of the upper beam. After the insertion of a weft straw, each of these stones is shifted to the opposite side.

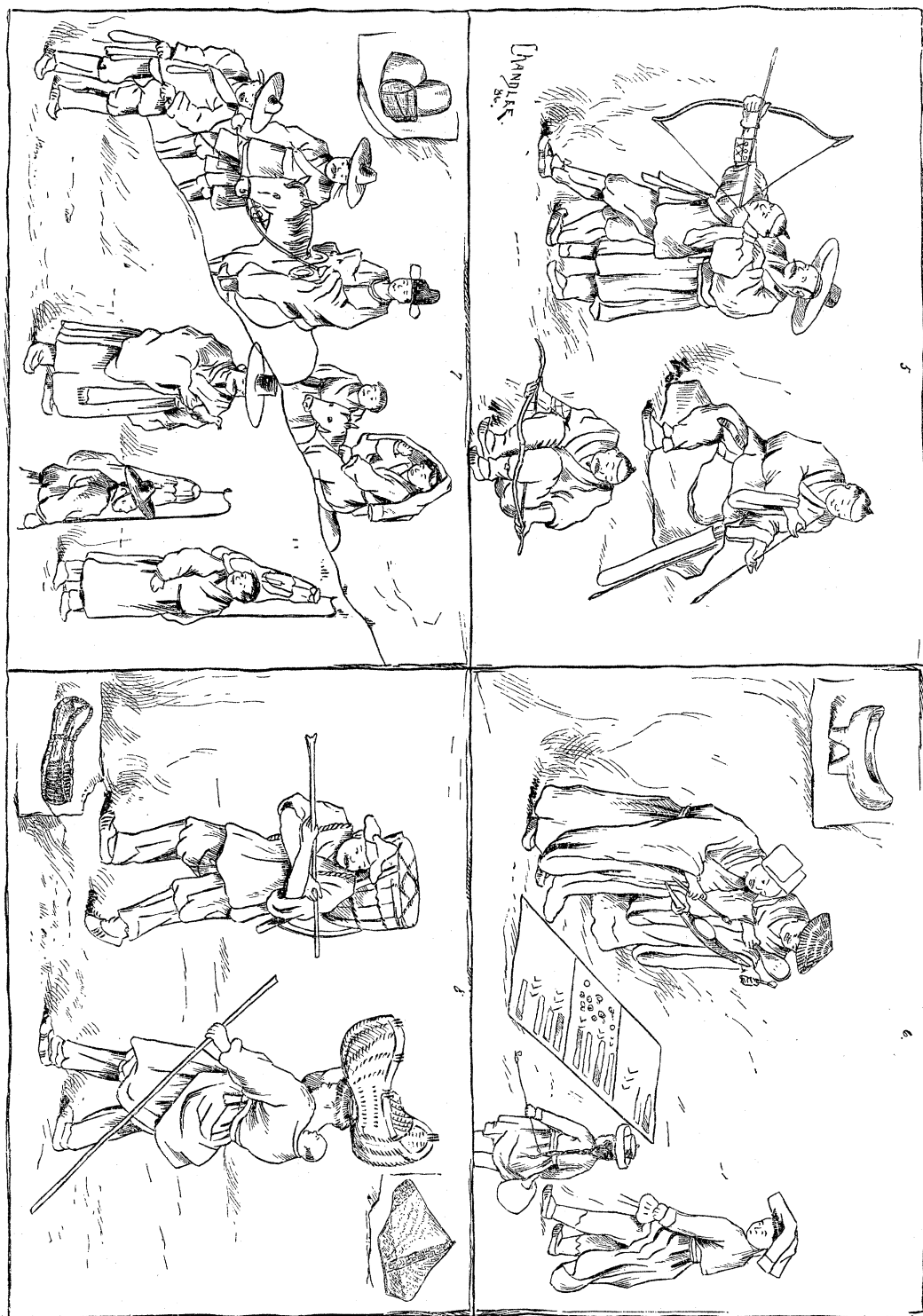
Shoeing a refractory horse (fig. 4). — The blacksmiths and other metal-workers of Corea are quite clever. Some of their silver and copper inlaying done on jewelry boxes and furniture contrasts favorably with similar work by their neighbors. The bellows consists of a square box, in which a plunger of wood packed with paper passes up and down.

A lesson in archery (fig. 5). — Archery is still a favorite amusement among the Coreans, and their soldiers are obliged to compete in yearly practice for prizes. Men of straw are set up in boats as marks. Great care is bestowed both on bows and arrows, and the junior members of the corps are carefully instructed in the precedents of practice.

Bonzes selling charms (fig. 6). — Mr. Lowell characterizes Corea as a land devoid of religion, Confucianism swaying the upper classes, and old superstitions the lower. Sorcerers and fortune-tellers sell their charms to men and women, often parading them in public, and announcing their presence with rude music. Mr. Griffis's 'man of straw' plays an important part, even now being sold and kicked to pieces as a scape-goat for the man's former self. In the drawing of the sorcerer is exhibited the quaint custom among Corean women of wearing on the top of the head a garment which they may draw over the face on the appearance of a man.

A wedding procession (fig. 7). — In the wedding procession we see the lantern-men preceding; the bearer of a wild duck or goose or a model, symbol of domestic felicity; the happy bridegroom seated on a horse led by a man and attended by another; last of all, the bride, attended by a young boy. Her garment, ready to cover her





face on meeting a man, is characteristic, as well as the court dress and robe of the groom.

Pedlers on the road (fig. 8). — Pedlers are common throughout Corea. In our sketch are represented the methods of carrying loads and children, and the costume, hat, and shoes of the lower classes.

Each one of the paintings is as graphic and instructive as those presented. It is very difficult to impress upon the mind of ordinary travellers that it is just the information conveyed in such pictures that the anthropologists need. To write the life-history of our practical arts, it is absolutely necessary to understand the minutiae of industry in every stage.

O. T. MASON.

BIRD-DESTRUCTION.

IN December, 1885, the American ornithologists' union committee on bird-protection began its work in behalf of the birds. After one or two conferences the committee became convinced that nothing would tend more to check the lamentable wholesale slaughter of our birds for millinery and other purposes than the proper enlightenment of the public respecting the extent of the annual sacrifice of bird-life, its causes, and its effects; that the almost universal use of birds for decorative purposes was due to thoughtlessness, and to ignorance of its baneful results; that in order to stem the tide of destruction it was simply necessary to make known the facts in the case, and thus create an intelligent public sentiment in favor of the birds. Accordingly the committee prepared a series of articles on the subject, which was published as a sixteen-page supplement to *Science*, in the issue of Feb. 26, 1886. This supplement was subsequently republished in pamphlet form as 'Bulletin No. 1' of the committee, and sent broadcast throughout the country.

The result far exceeded the most sanguine hopes of the committee: the press of the country took up the subject vigorously, there being scarcely a newspaper, magazine, or journal of any sort, technical, literary, educational, religious, or scientific, that did not publish copious extracts from the *Science* supplement, usually with editorial comment highly favorable to the movement thus started. This was often followed by letters from correspondents in further support of the cause, while not a few of the leading newspapers became earnest champions of the birds. At the same time various societies of natural history, in Canada as well as in the United States, appointed committees on the subject of bird-protection, which presented reports to their respective societies, embodying further evidence regarding the extent of

the destruction of birds for millinery and other reprehensible purposes, frequently accompanied by resolutions indorsing most fully the conclusions and recommendations of the American ornithologists' union committee, and urging the most energetic measures possible to check the destruction of bird-life.

The Audubon society was speedily organized in New York City, under the auspices of the *Forest and stream* newspaper, for the express purpose of co-operating with the American ornithologists' union committee in its work of protecting the birds. Branches of this society have sprung up in various and widely distant parts of the country, till the membership already exceeds ten thousand. Anti-bird wearing leagues and juvenile 'bands of mercy' were formed in many towns and cities throughout the land, having the same objects in view, the members of which respectively pledge themselves not to use birds for decorative purposes, and not only not to destroy birds or their nests or eggs, but to exercise all their influence in checking their needless destruction.

Until recently the only discordant notes heard from any quarter were the subdued mutterings of a few reprehensible taxidermists, caterers of the milliners, whose pockets were affected by the movement in favor of the birds. Many of the dealers in birds for decorative purposes, particularly for hat ornamentation, expressed themselves as heartily in sympathy with the movement, as have the better class of taxidermists,—those legitimately entitled to the name, who are often men of scientific tastes, and too high-principled to lend themselves to the indiscriminate slaughter of birds simply for purposes of gain.

It was left, therefore, for a single ornithologist of some supposed standing as a man of sense and culture to make the first and thus far the only public protest against the movement, which he is pleased to term 'sentimental bosh.' Whatever his object,—whether a freak of the moment, an attempt to see what could be said on 'the other side,' a strike for notoriety, or the result of personal pique,—his statements were of a sufficiently sensational character to be eagerly seized upon by newspaper editors ignorant of or indifferent to the facts in the case, or unscrupulous in regard to what they put in their papers, provided it is 'interesting' or 'startling'; and the 'address' of the 'learned doctor' has consequently received more or less attention; and extracts from it, or editorials based upon it, have been published in two of the New York dailies, and possibly elsewhere, in addition to the paper in which it originally appeared.

The person who has thus attained unenviable

notoriety is Dr. J. W. Langdon of Cincinnati, and his 'address' originated in the following manner : Some time since, the Cincinnati society of natural history appointed a committee of three of its ornithological members "to investigate and report on the destruction of native birds." This committee duly made its report, in the form of a series of papers, prepared by the different members of the committee, in which were summarized most of the facts and statements given in the *Science* supplement on bird-protection, with, in addition, much original matter of like character. This report was followed by a paper by Dr. Langdon, in which he ridiculed the idea that there had been any perceptible decrease of song-birds in consequence of their destruction for millinery purposes, or from any human influence whatever, while he furthermore claimed that it would be impossible for man to destroy enough small birds to make their absence appreciable. His conclusions were based, ostensibly at least, on an estimate of the bird population of America, and an assumed rate of natural increase,—both mere guesses, and the latter and his conclusions therefrom palpably absurd. Like some of our astute congressmen, he took the precaution to 'revise' his paper before it was printed, removing many of its grossest absurdities ; leaving, however, enough to disgust intelligent ornithologists throughout the country, yet presenting so plausible an aspect as to be misleading to the general reader, unable to detect the false premises, misstatements, and misrepresentations of which it is mainly composed. The better part of the paper was later given to the readers of a New York daily newspaper ; and its main points are summarized in a recent number of *Science* (viii. No. 178), and therefore need not be dwelt upon here.

To answer Dr. Langdon's paper in detail is not the purpose of this article. While it would be easy to refute its many absurd conclusions, and expose its misrepresentations, it would take much space to do so. For ornithologists no refutation is necessary ; and it would not be entitled to serious consideration were it not so perniciously misleading to those who know little of the subject. It has, however, been already ably answered by the Cincinnati committee, at a meeting of the Cincinnati society of natural history held June 16, at which the consideration of Dr. Langdon's paper was made the special subject of the evening.

As a sufficient answer in the present connection, I subjoin the final report of the committee of the Cincinnati society on the destruction of native birds, adopted by the society at its meeting held July 6, premising merely that it was adopted

with only one dissenting vote, and that Dr. Langdon's.

Your committee report as follows in the matter submitted to them, and state that they have fully investigated the subject of the destruction of our native birds, and several papers have been prepared and read at three meetings of the society. They find :—

First, That native birds of many species have greatly decreased in numbers over large areas of the country. This is particularly true of those water and game birds about which it is comparatively easy to obtain statistics.

Second, That the chief cause of such decrease, in addition to climatic changes, natural enemies, clearing up the country, etc., are,—

(a) The direct destruction of birds for their skins and feathers for decorative and millinery uses ;

(b) The trapping of birds for cage purposes ;

(c) The destruction of eggs and nests by men and boys ;

(d) And the introduction of the European sparrows, which occupy the nesting-places of many native species.

Three of these causes are preventable, and the evils resulting can be greatly lessened :

First, If no birds be used for decoration.

Second, If none of the song-birds and insectivorous species be used for food.

Third, If the laws protecting certain species be backed by a much stronger public opinion, and more rigidly enforced.

Fourth, If thoughtless men and boys could be shown the great economic value of birds, and taught the desirability of protecting them and their eggs.

Your committee find that a wide-spread discussion of the bird question shows more interest in our feathered friends than they had hoped for ; and they trust that Cuvier clubs, Audubon societies, and other clubs of like aims, will continue to flourish on all sides until public sentiment is entirely opposed to the destruction of our native birds.

R. H. WARDER
CHAS. DURY
WM. HUBBELL FISHER } Committee.

J. A. ALLEN.

GEOGRAPHICAL NOTES.

Yucatan.—The indefatigable Charnay, who has just closed another season of exploration in Yucatan, reports that he had been engaged only about six months. His object was to get moulds of the bas-reliefs on the walls of the ancient ruins. These sculptures proved to be much rarer than is generally supposed. Arrived at Izamal, he excavated the north side of the pyramid, which he hoped to find entire, but it proved to have been destroyed so that only about eight square metres of carving remained, which were not the less interesting on that account. However, in uncovering the base of the pyramid ancient mural paintings were revealed. A sort of chronic insurrection between the Indians of Maya stock and the Spanish-Americans has been going on for many years, and will probably end only with the extermination of one or the other party. In thirty years it is said 300,000 people have fallen victims to this conflict. A visit to Koba was prevented by a new incursion of the Mayas, and in taking a new direction Charnay came upon an old town, quite unknown,

called Ek Balam, or the city of the black tiger. He was obliged to get away very soon, but now that the place is known it can be revisited. On an island about eight leagues north of Campeche he found a Maya burial ground which has never been investigated by a man of science. He lived here about fifteen days, the Indians gradually abandoning the camp for fear of the dead men's retaliation, owing to the death of one of their number. He then returned to Ek Balam, where he remained eighteen days. He is now busy on his report, which will be ready in a few months.

Greenland.—The information derived from the Danish newspapers in regard to Lieutenant Ryder's expedition to Greenland is enlarged and corrected on the authority of that officer. The party should have left Copenhagen on May 9, and did not expect to return before the autumn of 1887. The commission, besides Messrs. Ryder and Bloch, will comprise the geologist Ussing. The object of the exploration to be made is the little-known coast between Melville Bay and Upernivik, which has never been scientifically surveyed. It is hoped that suitable charts can be prepared when the commission has finished its researches, which will include soundings as well as geographical and geological surveys.

A newly discovered lake on the Spanish frontier.—Schrader has for some years been engaged upon surveys among the higher Pyrenees, and recently presented the third leaf of his proposed six-leaved chart of the central Pyrenees to the Paris geographical society. On this occasion he called attention to several points of interest. This third leaf represents the Aran valley on the north slope, but which being Spanish territory has not been included in the map of the French general staff. Part of it has been represented as draining into the Mediterranean, while it really is tributary to the Garonne. In the second place, Schrader's triangulations, made with difficulty amid the fogs and wind-storms of the higher peaks, showed a gap unfilled between two chains of peaks which, approached from opposite sides, he had supposed to form a single range. The explorations of Dr. Jaubernat of the Alpine club, of Toulouse, a zealous botanist and photographer, showed that this gap was filled by a lake, the largest on the whole northern slope of the Pyrenees. No one else had ever seen it. So it appears that it is only since the summer of 1883, when Jaubernat took his photographs, that any one has known of the existence of the largest lake on the Spanish frontier. M. Schrader adds that on the south and south-east of the Aran valley, several ranges are to be found, nearly ten thousand feet in height, which as yet have no

place on any geographical map. It would seem that explorers may still find congenial work, even in Europe.

LONDON LETTER.

It is probably known to many readers of *Science* that a trial has lately taken place in London, the result of which, if not reversed by appeal, will seriously affect the future of electric lighting in this country, so far as incandescence lamps are concerned. Nobody but Messrs. Edison and Swan may now use the carbonaceous 'filament.' The use of such filaments is decided to be an infringement of the patent granted to Mr. T. A. Edison (Nov. 10, 1879; No. 4576), for the use of a 'light-giving body of carbon wire or sheets.' It has just been pointed out by Mr. Mattieu Williams, who himself assisted in the experiments more than forty years ago, that the real inventor of the process for obtaining light by the incandescence of a strip or wire of carbon was a young American, Mr. Starr, whose patent for it (taken out by Mr. King) was enrolled on May 4, 1846. At the end of a barometer-tube a bulb was blown, into which a platinum wire was fused, and to one end of this a stick of gas-retort carbon was fastened, the other wire being carried through the mercury,—the whole tube being 33 inches long. Mr. Starr tried platinum, and platino-iridium alloys, in wires and sheets, carbonized threads, cane, etc., before he hit upon gas-retort carbon. The lamp was repeatedly exhibited in action, at the town hall, and the Midland institute in Birmingham, by Mr. Williams. The carbon stick was 0.1 inch in diameter and 0.5 inch long; and the platinum wire had the same sectional area as the rod. The light was eminently and brilliantly successful; but funds were exhausted, and none concerned in it were adepts in getting up companies. Moreover, Mr. Starr was engaged in improving the magneto-electric machine then in use for electroplating, etc., by Messrs. Elkington of Birmingham; hence the matter was not followed up.

A very ingenious primary battery has just been brought into public notice by Messrs. Woodhouse & Rawson, the invention of M. René Upward. An outer cell, sealed at the top, holds fragments of carbon, slightly moistened with water; an inner porous cell contains zinc immersed in water. Chlorine gas is passed through the outer cells, each of which is of course provided with an inlet and outlet pipe, and a vacuum of about 0.5 inch water is maintained in the whole series of outer cells. The electromotive force per cell is 2.4 volts. The battery is entirely free from 'local action' and 'polarization,' and has been specially designed for small electric-light installations. For

this purpose, it is well to connect it with some form (preferably that known as E. P. S.) of storage battery or accumulator. The chlorine is disengaged very simply from hydrochloric acid and manganese, and a necessary part of the apparatus is a small gas-holder, conveniently constructed of drain-pipes covered with pitch. All the gas apparatus is worked on the displacement principle, chlorine being nearly $2\frac{1}{2}$ times as heavy as air. The apparatus necessary to establish a small installation of 15 to 18 ten-candle power lamps costs about \$250. The commonest sheet zinc may be used, and the corrosive action is very slow, and remarkably regular.

At a recent conference at the Colonial exhibition, a paper was read by Mr. Sievwright on Colonial telegraphs, in which warm tributes were paid to the early labors, 1^o, of Dr. (now Sir Wm.) O'Shaughnessy in India, who in 1839 and following years carried out experiments on the transmission of telegraphic signals by 'galvanism;' and 2^o, of Mr. T. R. Crampton, the engineer who in 1851 laid the first submarine cable across the English Channel, and whose pluck and energy found, in addition, nearly the whole of the money necessary for the undertaking. Mr. Crampton was present, and made an interesting speech in the discussion which followed, in the course of which, also, the need of a submarine cable from the American to the Australian continent was alluded to.

The newly organized gunpowder factory at Chilworth was recently inspected by a party of scientific men, where, under Herr Hiedemann's direction, the new brown or 'cocoa' powder is being produced. Wood charcoal is replaced by another form, and the proportions of sulphur and nitre have been so changed that but little smoke is produced. Except in a gun-chamber, the firing of the powder is very slow, and a new departure in the history of artillery has taken place.

Dr. C. R. Drysdale, senior physician of the Metropolitan free hospital, is one of the most recent distinguished converts to Pasteurism. Having visited Paris, and investigated 740 cases treated in the Rue Vauquelin, in which there was no doubt of the madness of the dog, he gives the death-rate as 0.75 per cent, while under other treatments, the death-rate is 16 per cent. Hence he considers that the value of M. Pasteur's treatment is 25 times as great as that of all the other treatments.

The use of petroleum as fuel was the subject of a paper by Colonel Stewart at the United service institution recently, and a warm discussion followed. The Russians have now applied liquid fuel in various ways to 200 steamers, 700 or 800

locomotives, and probably 1,000 stationary engines. In England the use of liquid fuel is still only in an experimental stage, whereas in Russia the labors of Urquhart, Lentz, and other sound practical engineers, have made it as familiar as constant practice can make anything. A suggestion was made that English ship-owners should send one of their staff to Baku to examine the various systems in use. Two pioneer steamers are now being fitted out on this principle in West Hartlepool, one of which, the *Glückauf*, is to be engaged in carrying oil from the United States. She is of steel, to carry 3,000 tons dead weight, fitted with triple-expansion engines, with cylinders of 22, 35, and 58 inches diameter. Two single-ended steel boilers, with two furnaces in each, are expected to develop 1,000 horse-power. W.

London, July 13.

NOTES AND NEWS.

THE local committee of the American association announces that the arrangements for a successful meeting are fairly completed. A misstatement was made in the first circular regarding telegraph dispatches. The Western union telegraph company has consented to accept for free transmission over its lines only the *official* telegrams of the association, and will charge one-half of the regular rates to members who have their messages stamped by the local secretary. The American express company, the United States express company, and the National express company will ship packages over their own lines free of charge to Buffalo providing, such packages, 1^o, contain specimens, etc., to be used during the meeting; 2^o, do not exceed twenty-five pounds in weight; 3^o, are shipped at owner's risk and are addressed to the American association, care of the local secretary at the High school in Buffalo. The following programme has been arranged by the local committee: Thursday, afternoon, excursion down the Niagara River to Grand Island; evening, the Botanical club of Buffalo will receive the Botanical club of the association, at the residence of Hon. David F. Day; the Entomological club of Buffalo will receive the Entomological club of the association at the rooms of the Society of natural sciences. Friday, afternoon, Mrs. Bronson C. Rumsey will receive the association at a lawn party at her residence on Delaware Avenue from 4 to 6 o'clock; evening, illustrated lecture by Prof. C. A. Ashburner, on 'the Geology of oil and gas.' Two excursions will be given to the members of the association on Saturday, one to Niagara Falls, the other to Chautauqua Lake. Monday, afternoon, excursion of the Botanical

club of the association to Point Abino in company of the Botanical club of Buffalo; and excursion of the Entomological club of the association to Ebenezer in company of the home club; evening, receptions at different places. As another large convention is held in Buffalo during the same week, it will add greatly to the comfort of the members to have the necessary rooms engaged prior to their arrival, and notices to that effect should be sent as soon as possible to the local secretary.

— The Pilot chart for August, just issued by the Hydrographic office, contains information appropriate to the season: The tracks of tropical hurricanes on their curved course into the temperate zone drawn for eleven examples recorded in previous years. It is also announced that the charts for the months of August, September, and October will contain brief accounts of the form and motions of the tropical cyclones that characterize this season, and the signs of their approach; of the principles on which the rules for their avoidance are based; and of points that need additional information. The first of these papers is printed on the current chart. The slow progress made by a wreck east of the Gulf Stream off Charleston is of interest; as is also the curious direct and retrograde course of the bark Rowland Hill in mid-ocean. The following tells a sad story: "Captain Maddox of the British steamer Norseman reports passing close to a raft and a heavy stick of timber, on July 13, in latitude $42^{\circ} 49'$ north, longitude $66^{\circ} 0'$ west. The raft, about twenty feet square, was strongly built of heavy square timbers, stoutly lashed and wedged, and had evidently been used by a shipwrecked crew."

— The U. S. coast survey has recently issued a chart of the approaches to New York showing remarkable features of much interest to navigators. Among them is a mud gorge which appears to have been formerly an extension or continuation of the bed of the Hudson. It extends from Sandy Hook out to the ocean basin, through a sea-bed of sand. The earlier surveys showed a number of mud holes off the entrance to New York harbor, and these, from their depth and the peculiar characteristics of the bottom, have long served in some degree as guides to the mariner. The recent re-survey of this locality with improved facilities has developed the fact that instead of detached holes there is a continuous gully. Ensigns Henry E. Parmenter and Walter O. Hulme have been ordered to the *Palinurus* at Stamford, Conn. Ensigns I. K. Seymour, C. M. Fahs, and H. P. Jones have all been ordered to the *Endeavor* to work on the re-survey of New York harbor.

Naval Cadet R. Welles and Ensign A. W. Dodd, the latter having been detached from the *Gedney*, have been ordered to the *Arago* at her new station on the Long Island coast. Ensign C. S. Williams has been assigned to the *Eagre* for duty in Long Island sound. Lieut. Commander Brownson, chief hydrographic inspector, will inspect next week the work and vessels engaged in the survey of Long Island Sound. Lieut. F. H. Crosley, commanding the steamer *Gedney*, has been granted two weeks' leave of absence; Ensign J. S. Watters will be in charge of the work. Lieut. J. E. Pillsbury, in command of the coast survey steamer *Blake*, has been conducting an interesting series of experiments in the Gulf of Mexico, measuring by the aid of an instrument of his own invention, the depth and velocity of sub-ocean currents. Lieut. E. D. Taussig of the coast survey, who has been conducting work off Cape Mendocino, California, has been detached and ordered home to await orders. The coast survey operations of the steamer *Hassler* in that vicinity have been attended with considerable difficulty not to say danger, on account of the high seas in that locality. Lieut. Commander W. N. Brownson, U. S. N., hydrographic inspector, of the U. S. coast survey, leaves Washington this week to inspect the work of the survey on Long Island Sound.

— The Senate has passed the bill for the relief of the party composing the Greeley Arctic expedition. It appropriates \$703.75 in lieu of computations for fuel and quarters and extra duty pay to each of the nineteen persons composing the party. It also provides that if any of the nineteen persons shall have died prior to July 1, 1884, the allowance is to be computed to date of death and the money paid to their families.

— The history of the past two years seems about to be re-enacted in Italy. Cholera has appeared at Latiano, Francavilla, Venice, and Ferrara. Fiume in Austria is also infected.

— In the suit brought by the Society for the prevention of cruelty to animals in Jersey City against Dr. Beriah A. Watson to recover penalties for cruelty to dogs in experimental surgery, Justice Lane gave judgment against the doctor. The case will be appealed.

— Prof. William A. Rogers of the Harvard college observatory has been chosen to fill the chair of physics at Colby university, Waterville, Me.

— The U. S. S. *Dispatch* was ordered to sea recently to find and sink four wrecks that have been derelict for a long time and now reported

to be somewhere in the bight of sea between Cape Barnegat and Fire Island light.

— Dr. Rufus Haymond, a well-known student of vertebrate zoölogy, and one of the pioneer naturalists of the Ohio valley, died at Brookville, Ind., July 29, at the age of 81 years. He was a native of Virginia, and came to Indiana in 1826.

— Mr. B. W. Evermann, late of Indiana university, has been elected to the chair of natural sciences at the State normal school, Terre Haute, Ind.

— Mr. George H. Boehmer of the Smithsonian institution leaves Washington during the present month on a European mission, as agent for the library of congress and the Smithsonian, in perfecting a more systematic and satisfactory method for the international exchange of public documents published by each country.

— Mr. Nathaniel H. R. Dawson of Selma, Alabama, has been nominated by the President for the position of commissioner of education.

— Rev. Charles Henry Appleton Dall, father of Dr. Wm. H. Dall, the conchologist, died at Darjiling, India, on July 18. He had been for more than thirty years in the missionary service.

— Spirits of turpentine will remove unpleasant odors from the hands when all other deodorants fail.

LETTERS TO THE EDITOR.

**Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Feline telepathy.

IN the issue of your admirable journal for July 31, 1885, the then editor, my esteemed friend Prof. S. H. Scudder, a distinguished histologist of special eminence in entomology, does me the honor to notice my censorship of the American society for psychical research, and passes the compliment of calling me 'the well-known ghost-smeller,' perhaps with some 'occult' reference to my psychical researches.

Neither affirming nor denying this hard impeachment, I beg to cite Professor Scudder himself in connection with the interesting and instructive psychic researches now in progress concerning telepathy. I submit that the eminent entomologist is in his own person a demonstration of telepathy; and no false delicacy should make him shrink from offering himself as a good subject for telepathic experimentation on the part of the members of the American society for psychical research.

No one more than myself, among Professor Scudder's friends, sincerely deplores the painful affection of the respiratory passages from which he suffers when brought within a certain radius of a cat. It may be some mental consolation, if no alleviation of the difficulty of breathing, for the professor to reflect that his case is an interesting and valuable one for

the purposes of psychic research, since it is able thus to offer an important contribution to the science of telepathy.

If I am correctly informed, Professor Scudder does not require to see the cat, or hear the cat, or smell the cat, or taste the cat, or touch the cat, in order to become painfully alive to the proximity of the animal, in the way above said. None of his physical senses is concerned in the psychic cognition of the cat and its painful bodily result. This is telepathy, namely, thought-transfer without any known or recognized physical or mechanical means of communication. Professor Scudder is evidently telepathic with cats, as a psychist would express it. What subtle connection there is between the anthropoid and the aeluroid organisms in this case, resulting in such violent antipathy and respiratory derangement on the one hand and such complacent sympathy or entire apathy on the other, is hard to say; though it may be suggested that asthmatic breathing resembles purring in some audible respects. Whether any real mind-reading is here involved is doubtful, because it is impossible to say what cats think of Professor Scudder; though what this amiable gentleman thinks of cats, while under the shock of the feline telepathic impact, and also subsequently, is well known to the large circle of his friends.

When I was appointed by the Theosophical society its official censor of the American society for psychical research — a delicate and difficult office, which I reluctantly accepted about a year ago in the interests of psychic science — it became incumbent upon me to explain to the psychical society any fact in psychic science which they might succeed in establishing.

I cannot admit that the said society has established this case of telepathy, considering that I have been obliged to do so for them. But since one of their members has been the unwitting means of demonstrating feline telepathy, I pass the credit of the discovery over to the psychical society, with the compliments of the Theosophical society, and offer my explanation of the matter. It is the same 'Explanation of telepathy' which was printed in the *New York Nation* of Jan. 15, 1885, after Professor Scudder, with tender regard for my reputation as a scientist, had declined to publish it in *Science*, of which he was then editor.

All animals, plants, and minerals disengage from their bodies a substance variously called 'biogen,' 'od,' 'akasa,' etc., this aura or ultra sensible emanation having certain modes of motion which are the direct means of 'phenomenalizing' or making apparent to the natural senses those effects known as 'mesmeric,' 'magnetic,' 'nervauric,' 'telepathic,' 'spiritistic,' etc. Professor Scudder happens to be so constituted, in relation to cats, that the feline biogen, impinging upon the Scudderian, immediately makes him think of cats, transfers his thought from all other objects of interest to cats, fixes his mind upon cats, excites a violent 'psychic storm,' or emotional disturbance, and results in the painful physical derangement above noted.

It would interest any student of psychics to ascertain whether the eminent entomologist who furnishes this case does not suffer in much the same way from various other animals, as horses and cows. I venture to surmise that such will be found to be the case.

Any other explanation than I have given does not occur to me as probable. A physicist or biologist,

however, might base an opinion contrary to mine, on the ground of common zoölogical ancestry, heredity, atavism, and so forth, according to the general principles of evolution.

Not even a 'well known ghost-smeller' should retort by calling Professor Scudder a hitherto unknown 'cat-smeller,' because that would not be polite, and because the learned professor does not smell cats, in point of fact, when he enters into telepathic relations with those zoölogical organisms. And then, too, his apparent inability to become cognizant of unembodyed human intelligences by means of telepathy may be more a matter of necessity than of choice. Should he ever succeed in establishing telepathic relations with a ghost, let us trust he will find such method of communication less painful to his respiratory apparatus, and more conducive to his peace of mind.

ELLIOTT COUES, F. T. S.,
Censor A. S. P. R.

Washington, D.C.

Barometer exposure.

In President LeConte's last letter (*Science*, vol. viii. p. 80) he suggests that the effects of the wind on the barometer should be farther experimented on; since "it is evident, that, according to the conditions of exposure, the influence of the wind must tend sometimes to increase, and at other times to diminish, the pressure within the building in which the barometer is placed." Mr. Gilbert's and Mr. Todd's experiments (*Science*, vol. vii. p. 571, and vol. viii. p. 58) certainly indicate that the pressure is higher on the windward than on the leeward side of objects; and I have frequently found at Blue Hill observatory, that, if a window or door be opened on the side against which a strong wind is blowing, there will be a rise of the barometer in the building, and a fall again when the window is closed.

This does not prove, however, that the effect of the wind on an in-door barometer is as likely to make it read too high as too low. Both deduction from theory and induction from all of the facts so far gathered, I think, indicate, that, under all ordinary conditions, the effect of the wind must be to make an in-door barometer read too low. The experiments of physicists clearly demonstrate that air, in moving by at right angles to an aperture, lowers the pressure within; hence, while wind would tend to increase the pressure on the windward side of a building, on every other side and at the top of the building the tendency must be to reduce the pressure; and the total resultant must be a decided lowering of the pressure within the building during a strong wind. These points were only omitted from my first letter because I was desirous of being brief.

The effect of wind in lowering the pressure is probably strongly felt on board of ships, where the bottom and sides are tight, and the wind blows directly across the apertures at the top. This, perhaps, in part accounts for the very low readings sometimes reported in severe storms.

In his 19th paper (*Amer. journ. sc.*, Dec., 1883), Loomis makes a careful comparison between the observed gradients in severe storms and those computed by Ferrel's formula. The storms were those occurring on the Atlantic Ocean and in the United States; and comparisons were made on that side of the storms where the winds were strongest and

gradients steepest. He found that the observed gradients were always larger than the computed gradients, and the latter had to be increased by a suitable constant to equal the former. In these cases, might not the observed gradients have been only apparent, and partly due to erroneous readings of the barometer produced by a greater wind velocity near the centre of the storm?

H. HELM CLAYTON.
Blue Hill meteor. obser., July 26.

The swindling naturalist caught.

The geological swindler described in *Science*, p. 308, No. 165 (April 2, 1886), has finally been entrapped and captured here, and is now in jail at Kankakee, Illinois, for the sale of books which he borrowed from a gentleman in that town.

He passed here as 'Captain Lindley' of the U. S. army, detailed as 'instructor in geology' at West Point. I need not say that there is no such name in the Army register nor on the roster of instructors at the military academy.

As he will undoubtedly be sentenced for at least a term in jail, it is much to be desired that those who have heretofore been swindled by him may communicate promptly with the sheriff of Kankakee county. If he is not vigorously prosecuted, it will soon become necessary for the naturalist to carry a passport in travelling through this region.

S. A. FORBES.
Champaign, Ill., July 28.

A brilliant aurora.

At 9 P.M. on July 27, an arch of an aurora was noticed here through the clouds in the north-east. At 10.45 P.M. the sky was clear and a brilliant auroral arch stretched entirely across the northern sky with a height above the horizon of 15° or 20° and a width of about 5°. Beneath it the sky was very dark; but from its top stretched upward to within about 30° of the zenith the most brilliant streamers, which danced and flickered, and during the ten minutes preceding 11 P.M. showed beautiful colors at their base. At 11.10 P.M. the arch had become dimmer, and the streamers had developed into patches of light which stretched up still nearer the zenith. At this time waves or pulses of light shot upward from the north in rapid succession and moved with great rapidity. These continued, but the auroral arch gradually died away, and at 11.20 P.M. only patches of white light were visible, which covered about three-fourths of the northern sky. At 11.27 P.M. a large patch of white light in the north-east began visibly to move upward toward the zenith, and the patches on all sides began to extend in the same direction; so that by 11.30 P.M. the whole northern half of the sky was covered with patches of pulsating light. At 11.32 P.M. the patches extended eight or ten degrees beyond the zenith, and the magnetic zenith became apparent by the arrangement of the patches around it. After 11.35 P.M. the aurora began to die down, and by midnight only a whitish glow was visible in the north. At 2 A.M. of the 28th the conditions remained much the same as at midnight.

A number of meteors were seen in the north-east while watching the aurora.

H. HELM CLAYTON.
Blue Hill meteor. observ., July 28.

SCIENCE.—SUPPLEMENT.

FRIDAY, AUGUST 6, 1886.

THE PHYSICAL BASIS OF HEREDITY.

PROFESSOR HUXLEY, in his well-known essay, has described protoplasm as the material substratum of all vital phenomena, and established the term 'physical basis of life.' Recent investigations lead to the hypothesis that there is a special and visible substance, which is the material substratum of hereditary transmission from parent to offspring, and may be called, if we choose to imitate Huxley, the physical basis of heredity. The name of the substance is chromatine, in reference to the special affinity for coloring-matters, which is the most striking characteristic of the substance.

Chromatine, also called nucleine by some writers, is found in the nuclei of cells of all kinds. It is only recently that it has been clearly recognized, and a great deal of additional investigation must be accomplished before we can hope to know much about it. It was impossible to ascertain much concerning it hitherto, because the methods of preserving tissues for microscopical examination have become perfected only within the last few years, so far that the minute details of cell organization could be studied. Nor was it until the recent introduction of oil immersion objectives by Dr. Zeiss, that we had command of lenses sufficiently perfect for the investigation of chromatine. For those who wish to inform themselves more fully concerning the occurrence and peculiarities of chromatine, I refer to Carnoy's 'Biologie cellulaire,' which I venture to think the best general work yet published on the structure of cells.

For our present discussion a very brief statement will suffice. When cells, properly preserved, are stained with almost any of the dyes commonly used by histologists for the coloration of cell nuclei, the higher powers of the microscope reveal the fact that the nucleus contains three visibly different matters,—1°, the network of slightly colored threads; 2°, some dots or threads very deeply stained; 3°, the hyaline, or granular substance, in which the other parts are embedded. This basal substance, enchylema, is probably more or less nearly fluid during life, and is equivalent to the *kernsaft* of those German writers, who apply that term in its proper and restricted sense:

unfortunately it is employed with a variety of meanings. The network resembles the protoplasm network of the body of the cells, and is probably the intra-nuclear extension of the protoplasm. The deeply dyed parts are the chromatine; and the presence thereof appears, so far as our present knowledge goes, the essential and distinctive characteristic of a nucleus.

During the division of cells, in the great majority of cases, very remarkable changes occur in the arrangement of the chromatine, leading to the development of those striking appearances known as karyokinetic figures, or, as Flemming would like to have them called, mitoses. It is difficult to refrain from styling the latter term new-fangled; for the systematic duplication of terms with which Professor Flemming has unnecessarily burdened science of late can only be condemned. It is curious to encounter such pedantry in so industrious and sensible a histologist, because to overvalue terminology is the mark of mental poverty. As the figures in question are described in the more recent text-books of anatomy and histology very fully, we need allude only to the conclusion that the nucleus appears to lead the process of division, and the chromatine to lead the division of the nucleus. Nussbaum (*Arch. f. mikros. anat.*, xxvi. 504) points out, however, that in some cases the protoplasm apparently leads, alterations in it preceding nuclear changes. He refers especially to observations on Infusoria by Everts (*Zeitschr. wiss. zool.*, xxiii. 601) and Jickeli (*Zool. anz.*, 1884, p. 491). But to interpret such observations, we must not forget that the nucleus and protoplasm are interdependent, neither being able to maintain its existence without the other, at least in any instance where they are normally united. The fact that the visible alteration of the protoplasm in a certain rare case comes before that of the nucleus shows that the protoplasm probably has an active rôle in cell-division; but since even then its arrangement depends on the position of the nucleus, the evidence of the superiority of nuclear control is, I think, not affected.

On the other hand, there are many observations which may be interpreted as proofs that the nuclei have a regulating power over the cells, especially as regards their division and organization. A few of these may be instanced. 1°. After a cell is formed, its nucleus enlarges first, and the cell body follows it in growth. 2°. Kölliker, in

his paper¹ on heredity (p. 29 ff.), discusses the relation of nuclei to growth very fully and ably. The great extent of his learning has enabled him to present the manifold aspects of the question more thoroughly than any other writer. His argumentation seems to me so satisfactory that it does not require the weight of his great authority to establish the conclusion that without nuclei there is no growth. Of this, the most faith-compelling evidence is offered by the important experiments of Nussbaum and Gruber,² who found that when unicellular animals are artificially divided, the fragments containing nuclei continue to grow, while pieces without nuclei die off. 3°. The large unicellular Thallophtes, such as *Caulerpa* and *Codium*, become multinuclear before they attain their adult size. Further illustrations are given by Kölliker (*l. c.*, pp. 19-20). 4°. Perhaps the most striking demonstration of the importance of the nucleus is afforded by the experimental alteration of the plane of division of the ovum. Pflüger³ showed that the plane of the first division of the ovum is altered by tilting the ovum before the division begins, and keeping it in the same position during division; normally the plane passes through the white pole, but when the ovum is fastened in an oblique position, the plane is not in the axis of the ovum but in the line of gravity. Born⁴ has continued these remarkable experiments, and discovered that the nucleus changes its position when the ovum is kept tilted, and that the site of the nucleus determines the plane of division of the ovum.

Still more pertinent to the theme of this article are the phenomena of the impregnation of the ovum.⁵ In 1872 Bütschli⁶ discovered that two nuclei are present in the fertilized ovum of *Rhabditis dolichura*, a nematod worm, and that the two nuclei unite, becoming the first nucleus of the embryo. Oscar Hertwig⁷ proved

three years later that the two nuclei, or as they are better called, pronuclei, are derived, one from the nucleus of the ovum, the other probably from the fertilizing male element, the spermatozoon. His observations, which were made at that time on echinoderms, led him to the theory that "impregnation depends upon the fusion of two sexually differentiated nuclei." Both Hertwig himself and many others, notably Fol Selenka, Flemming, Platner, and Strassburger, have confirmed this conclusion, so that there is a very strong presumption in favor of Hertwig's theory being a true law for all cases of fertilization. Strassburger was for some time⁸ an opponent of the exclusive significance of the nuclei, holding the opinion that "there also occurs a copulation between the other equivalent parts of the spermatozoon and ovum," thus making the participation of cell protoplasm essential. But lately⁹ he has acceded to Hertwig's opinion, and has expressed himself in a recent publication¹⁰ with great distinctness in favor of the nuclei alone being essential to impregnation. Strassburger observed in some cryptogams the protoplasm of the male element to be so much reduced that hardly more than the nucleus remained, and found that in certain phanerogams only the nucleus of the pollen grain reaches the ovum.

The next point to be brought forward is that the spermatozoon, which forms one of the pronuclei, is in many animals developed exclusively from the nucleus. The formation of the spermatozoon has been much investigated, and yet very little thoroughly satisfactory work has been published in result. Although the great majority of the articles report more or less that is valuable, yet they also contain, too often, much that is crude, inaccurate, or even out and out false; so that it is a difficult task to unsnarl the truth from the mesh of error in which it is ravelled. Kölliker,¹¹ as long ago as 1841, advanced the hypothesis that the spermatozoa of all animals have the significance of nuclei. This is not quite correct, since the seminal corpuscles of nematods have the value of cells, as do probably also those of the higher crustacea, and possibly of other animals. It still remains true that in the majority of cases the spermatozoa are modified nuclei, and nuclei only. As regards the higher animals, the obser-

¹ 'Die bedeutung der zellenkerne für die vorgänge der vererbung,' in *Zeitschr. f. wiss. zool.*, xlii, pp. 1-46.

² *Science*, vol. vi, p. 4. See also Nussbaum's later paper in the *Archiv für mikroskop. anat.*, xxvi, p. 485. Nussbaum also cites Fr. Schmitz's experiments on the artificial division of plants. Schmitz's paper I have not seen: it was published in 1879, in the *Festschrift der naturforschenden gesellschaft zu Halle*.

³ Pflüger's *Archiv für die gesammte physiol.*, xxxii, pp. 1-80.

⁴ *Breslauer ärztlich. zeitschr.*, 22 März. 1884. I have not seen the original. There is an abstract in Hofmann und Schwalbe's *Jahresbericht* for 1884, p. 444.

⁵ For a synopsis of recent investigations, the reader is referred to the article 'Impregnation' by the author in Wood's 'Handbook.'

⁶ 'Beiträge zur kenntniss der freilebenden nematoden,' in *Nova acta*, xxxvi. 1773.

⁷ 'Beiträge zur kenntniss der bildung, befruchtung und theilung des thierischen eies,' in *Morphol. jahrbuch*, i.

⁸ *Ueber befruchtung und zelltheilung*, 1878, pp. 75-77.

⁹ *Ueber den bau und das wachsthum der zellhäute*, 1882, pp. 250-252.

¹⁰ *Neue untersuchungen über den befruchtungs-vorgang bei den phanerogamen als grundlage für eine theorie der zeugung*, Jena, 1884 (see p. 77).

¹¹ *Beiträge zur kenntniss der geschlechtsverhältnisse und der samenflüssigkeit wirbelloser thiere, nebst einem versuch*, etc., Berlin, 1841.

ventions of Flemming¹² and of several other recent authors seem to me conclusive.¹³ The footnote communicates more fully the further significant fact, that the male element is developed chiefly from the chromatine of the nucleus. The facts stated prove that a body consisting mainly of chromatine from the nucleus of a sperm cell can impregnate an ovum.

Oskar Hertwig was the first¹⁴ to point out the bearing of this induction upon the problem of heredity. It is obvious, since qualities may be inherited from the father, that the nucleus alone can furnish the means of transmission from parent to offspring. And, since it can accomplish this on the paternal side, it is probable that it can do as much on the mother's side, an assumption against which no evidence has been brought forward: hence the hypothesis that *the nucleus is the organ of hereditary transmission*. Further, since the chromatine is the characteristic of the nucleus, and since spermatozoa in some cases consist almost exclusively of chromatine, it is probable that *chromatine is the essential factor in the function of heredity*. The leading defenders of this double hypothesis are Hertwig, Strassburger, and Kölliker, all biologists as able as they are distinguished. Careful study of their writings must, I think, lead a candid mind to accept their argumentation; though of course one does not forget that hypotheses are not demonstrations.

Hertwig's paper¹⁴ is to be recommended as the best single essay, the one to be read by those who desire to grasp the essential points of the discussion of heredity, and yet have not the leisure to go through all that has been published. Hertwig writes admirably: his matter is well arranged, his language direct, and his thinking clear and forcible. In brief, his papers have many of the qualities which we expect in a model of scientific

writing. Some of his later ones exhibit less careful preparation.

Johannes Frenzel¹⁵ has published what may be characterized as a lengthy, and on the whole half-hearted, criticism of the hypothesis of Hertwig. The objections he brings forward are in large part those which necessarily occur of themselves to every competent judge of the problem. An older investigator would have perceived this, and accordingly dealt with the discussion with much greater brevity. Frenzel's first objection is, that it is not certain that the nuclei of the male elements are not still accompanied by some protoplasm when they fuse with the ovum. Unfortunately our author has overlooked that the best investigations show the mammalian spermatozoon to be derived solely from the nucleus. Frenzel's second objection is that there are cells without nuclei. Careless and incomplete observations have frequently led to the assertion that there are such cells, but the error has been again and again refuted. On pp. 97-98 Frenzel cites Bobretzky and Korotneff as authorities, but these authors have not made sure of the absence of the nuclei. On the contrary, their investigations on the insect eggs, in which cells without nuclei are supposed to occur, are so obviously insufficient that it is astonishing to find stress laid upon them. For my own part, I feel little hesitation in asserting that except, perhaps, among the very lowest organisms, *there are no cells without nuclei*. As regards the lowest organisms, there is uncertainty. Nothing to be called a nucleus is known in bacteria, for instance. We cannot, indeed, state at present that the continuance of life is impossible without a nucleus. On the other hand, our knowledge of the minute fungi and supposed monera is so imperfect, that it would be foolish to accept the dogma that these organisms have no nuclei. It is conceivable that in the lowest forms of life the material basis of heredity is a diffused substance, which in the progress of evolution has gathered together to result in the genesis of nuclei. Therefore, whether the lowest bionts are nucleate or not, they do not offer, so far as at present known, any valid objection to Hertwig's theory that the nucleus is the organ of heredity. There is nothing else in Frenzel's article requiring notice in this brief review. It will not, I think, repay those not engaged in the special study of the subject to familiarize themselves with the essay in question, for I am able to commend it only with reserve.

The last few years have not only brought us

¹² *Archiv für mikrosk. anat.*, xviii. p. 219.

¹³ The following authorities covering the period of the last eighteen months have dealt with the development of the spermatozoon in mammalia: BROWN, *Quart. journ. micros. sc.*, xxv. 343; WIEDERSPERG, *Arch. f. mikrosk. anat.*, xxv. 113; PLATNER, *Ibid.*, xxv. 564; BIONDI, *Ibid.*, xxv. 594; PLATNER, *Ibid.*, xxvi. 343; LA VALLETTE ST. GEORGE, *Ibid.*, xxvi. and xxv. 581. Others might be cited. I have given a synopsis of these researches in the *Boston medical and surgical journal*, cxiv. 460. Nussbaum, even in his latest paper, adheres to his belief that the spermatozoa are always cellular, and not exclusively nuclear. Unfortunately he does not state upon what grounds the results of so many investigators are to be set aside. The authors cited show that the chromatine gathers together within the nucleus, and that it forms the head of the spermatozoon, while a large part of the nucleus breaks down: hence the spermatozoon arises chiefly from the chromatine of the nucleus of the cell (spermatoblast).

¹⁴ 'Das problem der befruchtung und der isotropie des eies, eine theorie der vererbung,' in *Jena zeitschr. naturwissenschaft.*, xviii.

¹⁵ 'Das idioplasma und die kernsubstanz,' in *Archiv für mikros. anat.*, xxvii. 1886, pp. 73-128. Frenzel's position is best shown by a paragraph on p. 89 which summarizes his view.

fresh insight into the morphological basis, but also into the physiological function of heredity.

A few words are necessary about pangenesis. The hypothesis, as originally advanced by Darwin, was the suggestion of a masterly mind, and as a succinct and comprehensive expression of the facts of heredity, commands admiration. But the real worth and real significance of the hypothesis have not been grasped by those who have tried to better it: its value was not in explaining, but in expressing, heredity in hypothetical terms, which were at once suggestive and comprehensible. Haeckel, whose judgment has too often to be deplored, accepted pangenesis in the mistaken way, and made an attempt to improve upon it as an explanation, in a pamphlet¹⁶ which no competent critic any longer assigns serious value to. Indeed, were some one to assert that the alliterative euphony of its title, 'Die perigenesis der plastidule,' was its cleverest part, a physiologist might feel unable to prove the assertion erroneous. According to Darwin's hypothesis, every part of the body throws off particles, or gemmules, and some of these from each portion of the body enter the sexual elements, each of which, therefore, contains contributions from every part of the parent. The gemmules, by their multiplication in the embryo, reproduce their own kind, and so rebuild on the former pattern. Haeckel's perigenesis is, when separated from his rhetoric, the substitution of rhythmical vibrations for the different kinds of gemmules. It need hardly be said that not a tittle of evidence for this notion is shown, and that, as elaborated by its author, it violates the elementary laws alike of biology and physics. In these respects it recalls the delightful theory of Dr. Cohen,¹⁷ who, having noticed a certain resemblance of the ovum to a ganglion cell of the spinal cord, and of the spermatozoon to the unipolar cells of the sympathetic ganglia, gravely concludes, "The influence of the spermatozoon, the male hereditary influence, extends above all to the cerebro-spinal system, while the action of the ovulum, Goethe's 'ewig weibliches,' shows itself above all upon the organs subordinate to the sympathetic nervous system" (pp. 30-31). In physics,

also, Cohen even surpasses Haeckel: he attributes (p. 19) the entrance of the spermatozoon into the ovum to reaction between the positive electricity of the one and the negative of the other.

Brooks's¹⁸ modification of the theory of pangenesis well deserves consideration, although the subsequent progress of biology does not lead me to think it felicitous; but we can now recognize it as a step towards Nussbaum's valuable theory, and also towards Weismann's conception that sexual reproduction has for its object the maintenance of variability. Brooks's theory is advocated in his book on 'Heredity' (Baltimore, 1879): he states it succinctly¹⁸ as follows:—

"This paper proposes a modification of Darwin's hypothesis of the same name (pangenesis), removing most of its difficulties, but retaining all that is valuable. According to the hypothesis in its modified form, characteristics which are constitutional and already hereditary are transmitted by the female organism by means of the ovum; while new variations are transmitted by gemmules, which are thrown off by the varying physiological units of the body, gathered up by the testicle, and transmitted to the next generation by impregnation."

If this theory was tenable, there should be—to mention a single objection—little variation in individuals produced by parthenogenesis; and they ought always to be females, whereas they are sometimes males. There remains, not a new theory of pangenesis, but the valuable suggestion that the maternal influence causes less variability than the paternal. I am, however, strongly disinclined to anticipate the confirmation of this suggestion, especially because the males are not more variable than the females, as we should expect. I have some extensive statistics, which show that in mammals, at least, there are no essential differences between the sexes in variability. Even if Brooks's thesis should be established, it would prove only that the inheritance from the mother is stronger than from the father, and there would lack reasons for his abstruse hypothesis.

The first important step towards the substitution of a new theory, *vice* pangenesis, was taken by Dr. Moritz Nussbaum, whose memoirs¹⁹ on the differentiation of sex deserve great attention. Every one who feels interest in the general problems of biology, and is able to follow a technical paper, will find Nussbaum's memoirs profitable reading.

¹⁶ The pamphlet was published at Berlin in 1876. For some, considering its character, very gentle criticisms, see Ray Lankester in *Nature*, July 13, 1876, xiv. 235-238. Elsberg has also written on the subject in the *Proc. Amer. assoc. adv. sc.*, xxv. 178, and cites there earlier writings of his own. The perusal of his article has not enabled me to recognize any thing novel except the substitution of the term 'plastidule,' for 'gemmule' used by Darwin, and speculations as to composition of plastidules, as if he was groping after the conception of the micella of Nägeli, with which he was apparently unacquainted.

¹⁷ *Das gesetz der befruchtung und vererbung*, etc., Nördlingen, 1875.

¹⁸ *Proc. Amer. assoc. sc.*, Buffalo, 1876, p. 177, abstract of a paper read before the section of natural history.

¹⁹ 'Zur differenzirung des geschlechtes im thierreich,' in *Arch. für mikrosk. anat.*, xviii. (1880) pp. 1-113; and 'Ueber die veränderung der geschlechtsprodukte bis zur eiführung,' in *Ibid.*, xxiii. 155.

Professor Weismann²⁰ has adopted Nussbaum's conception, and defended it with considerable energy, adding also several important modifications. Nussbaum pointed out that there is noteworthy evidence in the development of various animals, tending to show that the germinal cells from which the sexual products are derived are separated off from the other cells of the embryo very early, and undergo little alteration. Hence he concluded that some of the original germ substance is directly abstracted from the ovum, and preserved without essential alteration to become, by giving rise to the sexual elements, the germ substance of another generation. Weismann insists upon the corollary, that the whole nature of the animal or plant depends upon its germinal substance, and that the reason why the offspring is like the parent is that in each biont some of the germinal matter is preserved unchanged. He calls this view the theory of the continuity of germ plasma. He follows Nussbaum also in emphasizing the fact that this theory is inconsistent with the theory of pangenesis and with the theory of the transmission of parental characteristics which are acquired through external causes. On these two points Weismann's second and third papers mentioned in the footnote²⁰ are the most important. I fully coincide with him as regards pangenesis, but am less inclined to do the same as regards acquired characteristics. It is upon the latter theme that Virchow has opposed him. I am compelled to say, however, that the distinguished pathologist has failed to understand Weismann's position correctly, and that most of his criticisms I cannot deem valid.

According to the theory of Nussbaum and Weismann, the cells in the embryo separate into two kinds, — 1°, the germ cells, which are converted into the sexual elements; and, 2°, the somatic cells, which constitute the body of the organism. The germ cells descend directly from the impregnated ovum, and undergo little alteration, so that

they have (in suspension) the power to produce a whole organism. It is difficult to agree to this remarkable speculation: on the contrary, we must side with Kölliker (*l. c.*, pp. 44–46), who says that a sharp division between germ cells and somatic cells cannot be maintained. The feeling that there is a flaw in Weismann's argumentation cannot be escaped. While we recognize the ability, the great ability, of his essays, and cannot read them without our minds appropriating much from them, we remain sensible of the mysticism which zigzags across his pages, now and then blurring his expressions, and making his thought indefinite. After reading his article on the 'Continuity of the germ plasma,' there lingers an uncomfortable sense of mental haze. I have already indicated elsewhere²¹ a more comprehensive theory, which is irreconcilable, so far as I can perceive, with the continuity theory. My views I hope to defend on another and more appropriate occasion. Nor is a discussion of Nussbaum's theory essential in this article. We turn, therefore, to the next point demanding attention.

Nägeli, the celebrated botanist, published in 1884 a large work containing a series of views reached at the culmination of a remarkable career of scientific research. The volume²² has been less studied than one would wish: it comprises over eight hundred pages, and is decidedly abstruse. Nägeli is led to the theory that there are in every living cell two substances, — one, which he calls *idioplasma*, in distinction to the other, which he names the nutritive plasma. It is the *idioplasma* alone which carries on the function of hereditary transmission. We have here the definite conception, that the character of a special constituent of living matter regulates the organization of it. In other words, Nägeli assumes the formative force to reside in a specific material substratum, which reproduces and perpetuates itself, occurs throughout the organism, and supplies fragments of itself to the genital products. The argument in support of this theory is very able, and one can but join in the praise which Kölliker and others have bestowed upon it so cordially. The theory itself supplies us for the first time with a tangible notion from which to work ahead. A clew is given as to the physiological process of heredity.

Putting together all that has been said, the conclusion is evident. Nägeli's hypothetical *idioplasma* is probably identical with the nuclear chromatine of morphologists.

²¹ MINOT, — 'Organization and death,' in *Proc. Amer. assoc. adv. sc.*, Ann Arbor, 1885.

²² *Mechanisch-physiologische theorie der abstammungslehre*, Munich, 1884 (available abstracts are given in the *Biolog. centralbl.*, iv, pp. 488 and 517).

²⁰ Weismann's first paper was read before the University of Freiburg as a *Prorektorats Rede*, and was published in pamphlet form at Jena in 1883, with the title 'Ueber die vererbung.' A second paper was read before the German Naturforscherversammlung in 1885, and appeared in the *Tageblatt* of that association: it was subsequently amplified and republished with the title, 'Die continuität des keimplasmas,' etc. (Jena, 1885). A third paper, 'Ueber die bedeutung der geschlechtlichen fortpflanzung für die selectionstheorie,' was likewise addressed to the Naturforscherversammlung, and published at Jena (1886). A notice of this last by Kollmann was given in the *Biolog. centralbl.*, v, pp. 673 and 705. At the same meeting of the Naturforscher, Virchow also delivered an address (since published in *Virchow's archiv*, ciii, pp. 1, 205, 413, and in shorter form in the *Biolog. centralbl.*, vi, pp. 57, 129, and 161), in which he attacked Weismann's thesis. To Kollmann and Virchow, Weismann has replied (*Biolog. centralbl.*, vi, p. 33).

It is my conviction that the hypothesis of pan-genesis, both in its original form and in all its subsequent modifications, has been definitely set aside. In its place we have the theory that the nature of the germ, i.e., of the impregnated ovum of each species, is the same over and over, not because there is in each case a similar collocation of gemmules or plastidules, but because the chromatine perpetuates itself, so that the same kind of chromatine is found in the one generation as in the generations preceding it and following it. *The child is like the parents, because its organization is regulated by not merely similar, but by some of the same, chromatine as that of the parents.* Perhaps, instead of chromatine we ought to say, in order to avoid an unjustifiable explicitness, nuclear substance.

When it is recalled that heredity is one of the fundamental phenomena of life, and that hitherto we have seen no hopeful way leading to its comprehension, we can understand the delight with which biologists welcome the new theory and its rich promises. CHARLES SEDGWICK MINOT.

ROSMINI'S PSYCHOLOGY.

THIS is the sixth volume of the translation which Rosmini's English disciples have undertaken to make of his principal writings, — a labor of devotion surely, not only by reason of the mere pains involved, but in view of the probable thanklessness of the English-reading public for whose sake they are all taken. When one thinks of the mere quantity of labor which Rosmini accomplished in his not long life, one cannot refuse to him the title of being one of the very small number of intellectual giants of the world. He is of the race of the Aristotles, the St. Thomases, the Leibnitzes, the Kants, and the Hegels. The mere cogitative energy of him, too, is fully equal to theirs. Every page he writes is filled with thinking as hard, subtle, and original as theirs; and his style is as clear and flowing as theirs is usually the reverse. His learning is prodigious too. In short, he is a miracle of intellectual force, compared with whom a mere reviewer's mind is as a midge against an elephant. But Rosmini is a *dead* giant, and the reviewer can have it his own way with him, because *he* is alive, and writes for readers taught by all their Lockian and Protestant education to treat the kind of thing that Rosmini represents — thoroughgoing, concatenated, and systematic ontologizing and theologizing by the conceptions of principle and term, substance and essence and act — as 'scholastic jargon,' and so to

close their ears. Scholastic jargon, too, it seems to this reviewer; only he has a bad conscience about saying it so shortly, and therewith turning Rosmini over to the disdain of many of our native philistines who at bottom are spiritually unfit to loosen his shoe. The last word has not yet been said about scholasticism. We are all scholastics without knowing it, so sure as we talk of things and acts and essence and force. But we don't elaborate our scholasticism, because Locke taught us that to do so led to no practical use. The only practical gain which accrues to a scholastic from his elaboration of what we all believe, is what Rosmini calls "the experience in himself of a kind of jubilation and felicity, which is so peculiar as to be unlike any other feeling and to bear testimony to its infinite source." This is the rapture of all intellectual order and harmony; but our race would willingly part with it, if only thereby it could buy a new way of peeling potatoes, or of teaching children how to read. We renounce one thing, scholasticism another. It is not that the distinctions made by Rosmini and other scholastics are false. On the contrary, they seem for the most part true. They are one way of seeing and naming the facts of life. But they are sterile: we can deduce from them no immediate practical receipts. To peel potatoes, we must look at other aspects of the world than substantiality and accidentality and the distinction between immanent and transient acts. Many are the aspects of every bit of reality, and all are equally true. But each carries us a different way. By a succession of accidents modern critics and men of science have stumbled on the aspects which lead to the ways of foreseeing and handling particular material events. Together, these aspects form the armament of the scientific and positivistic view of life, a hodge-podge of which we moderns are very proud, but of which, great as the practical fruits are, the speculative dignity leaves much to be desired. Maybe some disciple of Rosmini may show a path down from his categories to the practical details of life. It were sad that such strenuous and in many ways such exquisite thinking as his should be among the mere superfluities of human history. W. J.

CLERKE'S HISTORY OF ASTRONOMY.

THIS is in some respects a remarkable book, and takes its place at once in importance beside Grant's 'History of physical astronomy,' which it in a measure supplements. No clearer indication

A popular history of astronomy during the nineteenth century. By AGNES M. CLERKE. Edinburgh, Black, 1885. 8°.

Psychology. By ANTONIO ROSMINI SERBATI. Vol. ii. London, Kegan Paul, Trench & Co., 1885. 8°.

of the wonderful advance of the 'new astronomy' during the third of a century since Professor Grant wrote, and of the need of a historian for it, can be furnished than the fact that what was then called physical astronomy is now termed theoretical, mathematical, or gravitational; while to-day by physical astronomy is generally understood the investigation of the intimate relations between astronomy, physics, and chemistry as studied in the sun, stars, comets, planets, our own atmosphere, and laboratories.

Miss Clerke has been peculiarly happy in the rôle of historian. Terse and highly original in style, her work will hold the attention of every educated reader for its literary merit alone, while the copious footnote references to the original sources of information make it a mine of wealth to the student and astronomer. The work is so excellent, and also so rapid is the progress of astronomical discovery, that new editions will rapidly follow; and for the purpose of making them as valuable and accurate as possible, we trust we shall not be considered hypercritical in calling attention to a few points, either where further comment or criticism would seem desirable, or where we think an error of judgment or interpretation, or some slight slip of reference or quotation, has been made. Anything but a first-class work we should not consider thus worthy of attention.

On page viii., for 'Illinois' read 'Madison, Wisconsin.'

In the closing description of the total disappearance of Biela's comet, on pp. 127 and 128, it would seem desirable, for the benefit of the reader ignorant of the facts, to refer him to the description further on, pp. 377-380, of subsequent encounters with it in the form of meteor showers, the latter now to be supplemented by the shower of last November, since the book was written.

To the non-astronomical reader, and even to the amateur spectroscopist who only knows of the spectrum as given by an image of the sun covering the whole slit or by some form of integrating spectroscope, the reference on p. 254 to Lockyer's long and short lines will be unintelligible without such a description of his apparatus as will explain that his long or short lines indicated the existence of incandescent shells of vapor at greater or less distances round his electric spark terminals, whose image was thrown on the slit by a lens.

In the enumeration of phenomena observed during different transits of Mercury, pp. 290 and 291, reference should be made to the one most extensively observed of all, that of 1878, May 5 and 6, as described and discussed in the *Washington observations* for 1876, part ii., app. ii.

Probably the paragraphs on pp. 304 and 305 regarding Mr. Croll's theories of secular changes in climate would be somewhat modified since the rather merciless criticism these theories have received at the hands of Woeikof, from the standpoint of a scientific meteorologist. (See *Amer. journ. of science* for March, 1886.) We can hardly see a justification for the opinion, p. 315, that Professor Langley's researches lend countenance to the idea that the temperature of the full moon's surface is anything like 500° F. It is difficult to keep up with Professor Langley nowadays, but, so far as we understand his results, they almost certainly point to a temperature below 100° F., and very probably below the freezing point of water.

Upon reading the letters of Bakhuyzen and Proctor in *Nature*, xxxiii. pp. 153 and 245, the author will see that the period or rotation of Mars deduced by the former must be incomparably more accurate than Proctor's, and in a new edition Bakhuyzen's later value should be given.

In spite of the apparent partial confirmation from several sources, we still remain somewhat skeptical regarding Schiaparelli's canals upon Mars (pp. 324 and 325), especially the duplicate parallel ones. We shall look with interest for the attack upon Mars with the Lick 36-inch refractor when set up on Mt. Hamilton.

On p. 329, line 3, for 'Vesta' read 'Pallas.'

As to the idea that the distribution of the asteroids has been largely influenced by commensurability of period with that of Jupiter (p. 329), or that gaps in the rings of Saturn have anything to do with the distances of its satellites, we regard the theory as entirely unproven as yet, and would refer to an article on the subject by Professor Hall in the *Sidereal messenger* for September, 1885, also copied in the October number of the *Observatory*.

We question the advisability of referring to a meteor shower as 'star-drift' (p. 371, line 5), when this term has already crystallized into the definite meaning of community of proper motion among neighboring stars or systems of stars (p. 438).

The subject of photometry is not adequately treated in the volume. This really deserves a whole chapter, but does not even occur in the index, while the paragraph on p. 435 does no justice whatever to the subject. Several of Professor Pickering's results are incidentally referred to in various parts of the book, but some description of his wonderfully ingenious photometers and methods which have revolutionized the whole subject and given rise to so much discussion is certainly to be expected in a book of this high character. One of the most important of his works, the series of photometric observations of the eclipses of Jupiter's

satellites, which has now been going on for eight years at the Harvard college observatory, is not mentioned at all. We should like to say a few words here upon the importance of this particular series of observations, which has as yet not received due justice in print, but space forbids. By the way, the phenomenon of the eclipses of these satellites and their important relation to the velocity of light and the dimensions of the solar system is not referred to at all.

We regret that the pages concerning the relative value of large versus small telescopes (443 and 445) appear in so good a book, and we do not think they would have been so written had the author been a practiced observer. We have not space here to join in this wide discussion, but we would commend the author and our readers to the able summary of the case in the letter of Professor Young (*Observatory*, February, 1886,) as embodying the true gist of the whole matter. Incidentally, the curious misunderstanding of Professor Hall's letter (*Observatory*, May, 1885,) is worth noticing. How any one who has ever used a telescope can read this letter without seeing quiet sarcasm in every line, we fail to see. But our transatlantic neighbors in a body seem to have taken it as written in sober earnest, and the sermons preached from it have been highly amusing, even going so far as to suggest a possible permanent set or distortion in the lenses of the Washington 26-inch since its first manufacture. We advise Professor Hall to preface any future communications of this sort with 'The following is sarcastic,' or other equivalent explanation.

In the various discussions of reflectors *versus* refractors, we have looked in vain for a clear statement of the different effect, upon definition, of flexure of the mirror or objective. If gravity bends a lens so that one side is more convex, the other becomes more concave, and the effect upon definition is a quantity of another order entirely from that due to flexure of either side alone; while the bending of the surface of a mirror appears with its full effect upon the definition; so that a mirror which forms any part of a telescope and changes its position with reference to gravity must be almost infinitely more rigid than a lens in the same situation in order to perform equally well. This should be borne in mind in such discussions (p. 450).

Miss Clerke has not touched upon the subject of Mr. Denning's so-called 'fixed radiants' of meteor streams and the startling suggestions as to the peopling of interstellar space to which the claim has given rise. In the present uncertainty about the reality of the phenomena, perhaps it is just as well. With to-day's doubtful methods of map-

ping the tracks of meteors, our opinion is that we must wait till some Argus-eyed camera, whose overlapping lenses and plates (mounted on a hemispherical surface driven by equatorial clock-work) are sensitive enough to record the paths of all the fairly bright meteors, shall decide, by the doctrine of probabilities, as to the real existence of nine-tenths of the so-called 'radiants' of to-day.

Did space permit, pages might be written in praise of the excellent features of the book. But, where so much is good, we consider our limited space better employed in pointing out a part of the minor faults, in order that subsequent editions may be as perfect as possible. Hence, in so much as we may have seemed hypercritical, by so much we trust that the author will consider it a compliment to the general excellence and importance of her work.

H. M. PAUL.

Washington, July 24.

It is not a little curious, says the *Lancet*, that the diseases arising from the wrong use of tea should be met with in greater frequency in countries foreign to its growth. The diseases due to this cause are well known to doctors, but the public seem to be strangely indifferent to the teachings of their medical advisers in these matters. Recently in France M. Eloy has reminded medical men how vast is the number of diseases owing an allegiance to the dominion of Queen Tea. America and England are the two countries that are afflicted most with the maladies arising from its excessive consumption. Individuals may suffer in a variety of ways. It is customary to speak of acute, subacute, and chronic 'theism,'—a form that has no connection with theological matters. The predominance of nervous symptoms is a characteristic of theism. General excitation of the functions of the nervous system may be observed, or the weakness may be noted more especially in the brain as distinguished from the spinal cord. Perversion of the sense of hearing is not at all an uncommon symptom, patients hearing voices that have no real or objective existence. The irritability that overtakes women so frequently may sometimes be clearly traced to an excessive indulgence in afternoon tea. No doubt the tannin which tea that has been standing contains does a great amount of mischief; but theism belongs, rather, to that class of diseases in which morphinism, caffeism, and vanillism are found. The habit of tea-drinking is one that grows on its victims like the similar ones of opium or alcohol. Taken in strict moderation, and with due precautions in the mode of preparation, tea is, like alcohol, a valuable stimulant; in its abuse there is also certain analogy.